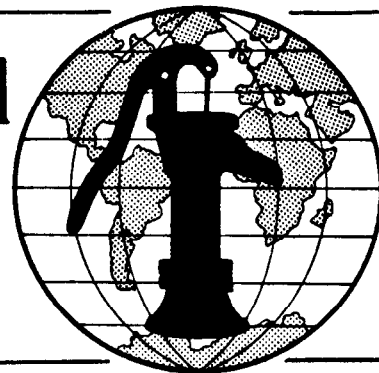


# Water for the World

## Planning Combined Wastewater and Excreta Disposal Systems Technical Note No. SAN. 2.P.1



Combined wastewater and excreta disposal systems may be appropriate where large quantities of wastewater are generated and where resources are sufficient to establish and maintain such systems. The advantages of combined systems are a high degree of sanitary protection and the capability to handle greater water use in the future. The disadvantages are the high capital costs and the need for routine maintenance. The purpose of planning combined systems is to determine their suitability and specific nature.

Planning combined systems involves setting goals, then establishing step-by-step procedures toward those goals. There are eight major actions involved in project development for which planning is important. It is necessary to: (1) recognize the problem, (2) organize community support and set objectives, (3) collect data, (4) formulate alternatives, (5) select the most suitable method, (6) establish the system, (7) operate and maintain the system, and (8) evaluate the system.

This technical note discusses planning and implementation of these eight activities. Read the entire technical note before beginning the planning process. Worksheet A may be adapted for use in cataloging information collected as planning proceeds.

### Recognize the Problem

This is done by gathering information from regional and national governments, questioning villagers and village leaders, and observing actual conditions in the field. Decide if the present methods of excreta and wastewater disposal pose a health hazard to the people in the community. That is, determine whether the people suffer from disease caused by poor sanitation.

(See "Means of Disease Transmission," DIS. 1.M.1). In general, the community should consider combined wastewater and excreta disposal systems if the answer is "yes" to the following questions.

Yes/No	Are piped water supplies the major source of community water?
Yes/No	Does the community generate 50 liters or more of wastewater per person per day?
Yes/No	Are present methods of excreta and wastewater disposal creating health hazards?
Yes/No	Do children or adults suffer from illnesses related to water supply or sanitation?

When the problem has been identified as unsanitary, improper, or inefficient disposal of excreta or wastewater, then goals can be set to solve the problem.

### Organize Community Support and Set Objectives

The main goal is to establish an effective system of excreta and wastewater disposal. This is a major step toward improving the health of the community.

This goal cannot be met without strong community support (see "Methods of Initiating Community Participation in Water Supply and Sanitation Programs," HR.2.M). Establish close working relations with community leaders and organizers. Actively solicit their ideas and suggestions. The people in the community should be involved from the start of the project, because all stages of the project must be understood and accepted by them.

## Worksheet A. Planning a Combined Excreta and Washwater Disposal System

1. Problems indicating a need for action are:

- (1) \_\_\_\_\_
- (2) \_\_\_\_\_
- (3) \_\_\_\_\_

2. Community support will be organized and directed by (name and position):

- (1) \_\_\_\_\_
- (2) \_\_\_\_\_
- (3) \_\_\_\_\_

2. a. Major objectives of the program are:

- (1) \_\_\_\_\_
- (2) \_\_\_\_\_
- (3) \_\_\_\_\_

3. Data which will influence decisions are:

- (1) Need: \_\_\_\_\_
- (2) Present Methods: \_\_\_\_\_
- (3) Community Acceptance: \_\_\_\_\_
- (4) Resources: \_\_\_\_\_
- (5) Geography: \_\_\_\_\_

4. Alternatives to be considered are:

- (1) \_\_\_\_\_
- (2) \_\_\_\_\_
- (3) \_\_\_\_\_

5. The method(s) selected is (are):

- (1) \_\_\_\_\_
- (2) \_\_\_\_\_
- (3) \_\_\_\_\_

6. The system will be established by:

- (1) Ensuring public acceptance by building demonstration models or by: \_\_\_\_\_
- (2) Submitting plans to (government or lending agency): \_\_\_\_\_
- (3) Obtaining financing from (government, lending agency, or other): \_\_\_\_\_
- (4) Planning the construction within \_\_\_\_\_ weeks.
- (5) Constructing the system within \_\_\_\_\_ months.

7. The operation and maintenance of the system will be supervised by (name and position):

- (1) \_\_\_\_\_
- (2) \_\_\_\_\_
- (3) \_\_\_\_\_

8. The system will be evaluated during (month and year) \_\_\_\_\_, by (name and position):

- (1) \_\_\_\_\_
- (2) \_\_\_\_\_
- (3) \_\_\_\_\_

Another part of the main goal is setting secondary goals such as a time span for establishing the system (for example, three months or one year). Secondary goals should be set with the participation and agreement of community leaders. Be realistic when setting objectives. Consider local customs and resources such as money, material, and talent. Do not set goals that may be impossible for the community to reach. Set goals that are definite and can be measured, so people will know when they have reached them. For example: build three septic tanks with subsurface absorption systems within six months; or, provide effective excreta and washwater disposal systems to half the families in the village in one year.

Your goals must: (1) clearly state what the project will accomplish, (2) state the methods that will be used, and (3) specify when these accomplishments will be made. At the end of the specified length of time, it should be possible to determine whether your objectives have been met.

When the objectives have been set, proceed with the next step in planning; data collection.

## Collect Data

To plan the system you must have correct data. The data can be divided roughly into five categories: (A) environmental conditions in the village, (B) present methods of excreta and washwater disposal, (C) attitude of the people, (D) resources, and (E) geography. Collecting data will be an ongoing process; some of it will be used now, some later.

Keep a written record of all data collected. Some data will be specific (for example, number of persons living in a dwelling, or a family's source of drinking water). Other data will be more general (for example: villagers' attitudes toward new methods of excreta disposal). Use the following checklist to help organize data collection.

### A. Environmental Conditions in the Village

- ☐ 1. Determine the incidence of disease associated with poor sanitation (see "Means of Disease Transmission," DIS.1.M.1) by personal observation, questioning villagers and village leaders, and checking health records if available. Local health clinics may have this information.
- ☐ 2. Observe and record evidence of excreta or washwater on the surface of the ground.
- ☐ 3. Determine whether excreta or washwater is being disposed of in or near sources of drinking water. Do this by questioning villagers and by personal observation.
- ☐ 4. Determine whether there are bothersome numbers of flies or mosquitos.
- ☐ 5. Determine whether there are foul odors.

### B. Present Methods of Excreta and Washwater Disposal

- ☐ 1. List the present methods of excreta and washwater disposal.
- ☐ 2. Determine how many of each method are in use.
- ☐ 3. Determine how many people use each facility.
- ☐ 4. Determine whether the present method can be upgraded or converted to those methods listed in "Methods of Combined Washwater and Excreta Disposal," SAN.2.M.

### C. Attitude of the People

- ☐ 1. Question the villagers and village leaders about their attitudes toward excreta and washwater disposal in general.
- ☐ 2. Question villagers and village leaders about their preferences concerning specific excreta and washwater disposal methods.
- ☐ 3. Identify local customs and taboos.

## D. Resources

- ☐ 1. List sources of money (government grants, taxes, general fund, and so on) and amounts available.
- ☐ 2. List types and quantities of available tools and equipment.
- ☐ 3. List types and quantities of available materials.
- ☐ 4. List the names and special skills of available skilled workers.
- ☐ 5. List the names of available unskilled workers.

## E. Geography

- ☐ 1. Record the type (well, spring, stream, piped), number, and location of all drinking water supplies.
- ☐ 2. Test and record soil conditions for suitability for excreta and wastewater disposal (see "Determining Soil Suitability," SAN.2.P.3).
- ☐ 3. Determine and record groundwater levels for the wettest season.
- ☐ 4. Record the number of villagers and the physical size of the village.
- ☐ 5. Record the number of family lots, the size of each lot, and the number of people per lot.

## Formulate Alternatives

Use the collected data and the information in "Methods of Combined Wastewater and Excreta Disposal," SAN.2.M, to formulate alternative systems of excreta and wastewater disposal. Each alternative may be a single method or several methods combined. When formulating alternatives, use only those methods that are practical for your community and are basically acceptable to the community members. Reject those methods which, for any reason, are inappropriate, impractical, or unacceptable.

The remaining alternatives are possible solutions to the problem. To determine the best method for your situation, proceed to the next step: selecting a method.

## Select a Method

When selecting a method of combined wastewater and excreta disposal, carefully study the features of each alternative and thoroughly analyze the collected data. The selection of a method should be based on the following considerations:

Need. Are present methods of excreta and wastewater disposal inadequate? Do people in the community suffer from disease caused by poor sanitation? Are large quantities of wastewater being generated?

Social acceptability. This is a most important consideration, for if the system is unacceptable to the people, it will surely fail. Will the method of disposal violate local customs, taboos, or preferences? Is the method likely to be maintained? Have the people indicated that they prefer this system, or at least are willing to try it?

Resources. Is the desired method practical considering available money, material, and workers? Is the regional or national government likely to provide monetary or other assistance?

Geography. Are soil conditions and groundwater levels acceptable for the desired method?

Plot size. Is the plot large enough to support an on-site system (at least 0.1 hectares)?

Wastewater. Is the quantity of wastewater more or less than 50 liters per person per day?

Use the comparison chart in "Methods of Combined Wastewater and Excreta Disposal," SAN.2.M, and Table 1 to help select a method of combined wastewater and excreta disposal. This decision table is not meant to be followed strictly; it is merely an aid in selecting a system. If you need more specific information on the features of any method, consult the "design" or "construction" technical notes dealing with that particular method.

**Table 1. Decision Table for Selecting a Combined Excreta and Washwater Disposal System**

If	And	And	And	Then
Existing excreta disposal systems are NOT creating health hazards, or washwater does NOT exceed 50 liters per person per day, or combined excreta and washwater systems are NOT affordable				Go to Simple Excreta Disposal (see SAN.1.M.1 SAN.1.M.2 SAN.1.P)
Existing excreta disposal systems are creating health hazards, or washwater exceeds 50 liters per person per day and combined excreta and washwater systems are affordable	Plot size is large enough for on-site systems (at least 0.1 hectares)	Soil suitable for on-site system	Septic tank affordable	Septic Tank with Sub-surface Absorption System
			Septic tank NOT affordable	Cesspool
		Soil NOT suitable for on-site system	Nonconventional on-site systems are affordable and necessary (i.e., building is a health clinic, restaurant, etc.)	Nonconventional On-site Systems
			Nonconventional systems NOT affordable or necessary	Go to Simple Excreta Disposal
	Plot size NOT large enough for on-site systems (less than 0.1 hectares)	Aqua privies or pour-flush latrines can be upgraded into a sewer system	Enough land for a series of ponds	Sewers with Stabilization Ponds
			NOT enough land for a series of ponds	Sewers with Mechanically Aerated Lagoons
		Aqua privies or pour-flush latrines CAN-NOT be upgraded into sewer systems		Go to Simple Excreta Disposal

#### How to Use the Decision Table

1. Find the statement in the "If" column that best describes your situation. If it is the top statement, go to "Methods of Simple Excreta Disposal," SAN.1.M.1 or "Method of Washwater Disposal," SAN.1.M.2.

2. If it is the bottom statement, move to the two adjacent boxes in the first "And" column and select the statement that best fits your situation.

3. From your statement in the first "And" column, move on to the two

adjacent boxes in the second "And" column and select the statement that best fits your situation.

4. From your statement in the second "And" column, move on to the two adjacent boxes in the third "And" column and select the statement that best fits your situation.

5. From your statement in the third "And" column move on to the adjacent box in the "Then" column to find the recommended method of washwater and excreta disposal.

## Establish the System

There are three steps in establishing the system: involving the public, submitting your plan for approval, and planning for construction.

Involving public. The first step in establishing the system is gaining public acceptance. Set up community meetings to fully explain the proposed system. It may be worthwhile to build several excreta disposal methods for demonstration. These will allow the people to examine, understand, and use the facilities. These demonstration models can serve as a final test of community acceptance before you construct large numbers of facilities.

Submitting plan for approval. The second step in establishing the system is submitting your plan to the regional or national government or a lending agency. Since they may have to approve the entire plan before you can proceed, your submission should include: (a) the proposed technical system, (b) costs, (c) sources of finance, and (d) an implementation schedule.

a. Proposed system. Submit designs, complete with drawings or photographs, of the method or methods selected. Decide how many units will be built and where they will be located. Be prepared to explain your decisions. Draw a map, perhaps a contour map, of the village and surrounding area. Include dwellings, sources of drinking water, and present and proposed locations of excreta and washwater disposal systems. Use the design drawings and maps in a presentation to the government agency or funding source. Bring village leaders, or others who speak for the community, to help explain the need for the project.

b. Costs. Determine how much money will be needed to pay construction workers. This will depend on salary levels, number of workers, and estimated time for construction. Determine how much money will be needed for materials, tools and equipment. Make every effort to use locally available materials. Estimate how much money will be needed to maintain and repair the system for a specific period of time--one year, for example.

c. Sources of finance. Funds may be available locally, nationally, and internationally. Your government can explain how to get national or international funds, which can be in the form of grants or loans. Local funds can come from taxes, user fees, or a general fund. The tax can be a special tax or an increase of an existing tax. Two user fees examples are: (1) charging villagers a monthly fee for using community latrines, or (2) charging families for all or part of the construction costs for individual systems. The general fund could be a health fund, with the purpose of improving water supplies and sanitation, into which everyone in the village pays a certain amount.

Determine the villagers' ability and willingness to pay for building the excreta and washwater disposal systems. It may be that local funds will not take the form of money, but rather of contributions of labor or materials. For example, villagers wanting septic tanks could be required to contribute all of the unskilled labor, plus the sand and gravel necessary for building the concrete tank. A government contribution or subsidy could be made contingent upon completion of the local contribution. For example, the government could supply the perforated pipe for the absorption field, but only after the villagers had constructed the septic tank.

Find out if the people are willing to pay for operating and maintaining the system once it is built. A great many systems fail because they are not properly operated and maintained and often this occurs because people are unwilling to pay these costs. If you do not take this into account, you may wind up with a system that will not work.

d. Implementation schedule. Assign specific, reasonable time spans to each stage of the project. Allow time to collect data, formulate alternatives, select a method, establish the system, and train workers to operate and maintain the system. To help visualize an entire project and establish timetables for it, draw a chart similar to Figure 1 with the month number across the top and the specific tasks on the left

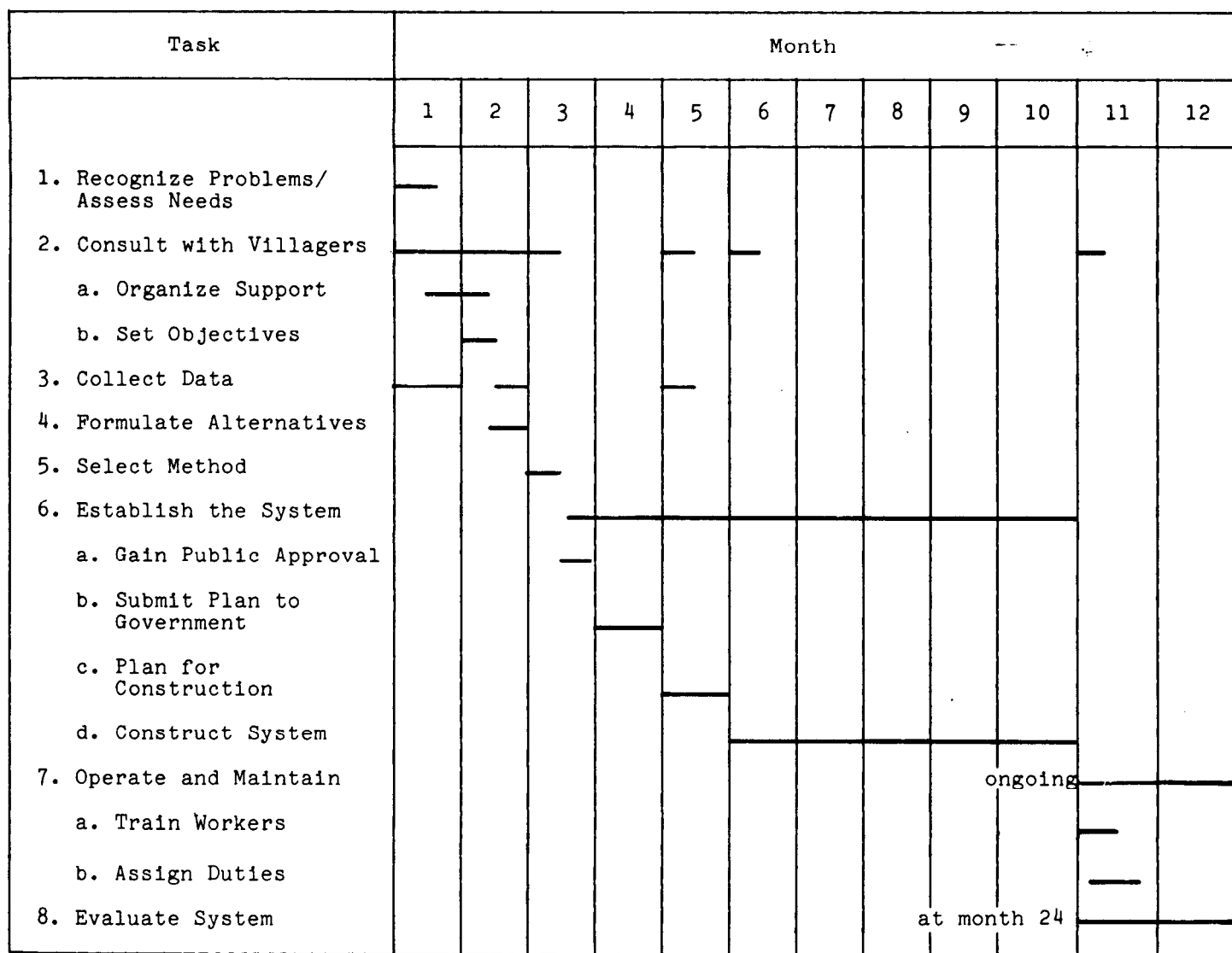


Figure 1. Sample Schedule for a Combined Excreta and Wastewater Disposal Project

side. Figure 1 also includes tasks performed from the start of the project such as recognizing problems, consulting with villagers, and early collection of data.

**Planning for construction.** The third step in establishing the system is planning for construction. Determine which components of the excreta disposal system can be constructed in the community, perhaps the septic tank, and which components will have to be purchased from outside the community, perhaps the sewer pipe.

Decide who will do the work, the type and amount of training they will require, and how much they must be paid. Determine which tools, equipment, and materials are needed for construction, and be prepared to

assemble them. Organize the construction. Be prepared to assign specific duties, set up time schedules, and hire a foreman to oversee the work.

### Operate and Maintain the System

It is critical that you plan for the continued use of the facilities after they are built. This includes inspecting and, if necessary, repairing septic tanks, cesspools, stabilization ponds, sewer lines, and subsurface absorption systems. Maintenance includes periodically removing and safely disposing of sludge from septic tanks, cesspools, and stabilization ponds.

Establish a system of routine cleaning, maintenance, and repair. Workers must be trained, and money and

materials must be made available to maintain the system. If these systems are not routinely maintained, they will fail to operate.

### Evaluate the System

Evaluate the project one year after completion to determine whether project goals have been achieved. Determine the success of the project by: (1) questioning villagers on their use or neglect of the facilities; (2) comparing before and after health aspects (examine individuals and study health statistics, if available); and (3) comparing the conditions of the facilities with the conditions existing before the

project began. One excellent way of telling whether or not people have been using the facilities is the incidence of Ascariasis (roundworm) in children. Determine if old problems have been eliminated, and decide if any new problems have arisen. Perhaps the village now needs and can afford a more advanced system of excreta and wash-water disposal, such as septic tanks instead of cesspools.

Sanitation improvements in rural villages are usually made one step at a time. Therefore, your evaluation of this project should be the first step in planning the next sanitation improvement.

Technical Notes are part of a set of "Water for the World" materials produced under contract to the U.S. Agency for International Development by National Demonstration Water Project, Institute for Rural Water, and National Environmental Health Association. Artwork was done by Redwing Art Service. Technical Notes are intended to provide assistance to a broad range of people with field responsibility for village water supply and sanitation projects in the developing nations. For more detail on the purpose, organization and suggestions for use of Technical Notes, see the introductory Note in the series, titled "Using 'Water for the World' Technical Notes." Other parts of the "Water for the World" series include a comprehensive Program Manual and several Policy Perspectives. Further information on these materials may be obtained from the Development Information Center, Agency for International Development, Washington, D.C., 20523, U.S.A.